CLAIMS

1. A system, comprising:

a generally upright deflector body characterised by a tilt angle relative to vertical; and

at least one bridle connected to a seismic cable, the bridle including an upper segment secured to an upper connection point on the deflector body, and a lower segment coupled to a lower connection point on the deflector body, wherein the upper segment, lower segment and deflector body define a geometry therebetween; and

at least one actuator for adjusting the geometry to control the tilt angle of the deflector body.

2. The system of claim 1, wherein the actuator adjusts the length of the upper segment of the bridle relative to the length of the lower segment of the bridle.

3. The system of claim 1, wherein the upper and lower connection points each comprise at least one rotatable towpoint.

4. The system of claim 3, wherein the rotatable towpoints include lever arms, pulleys, or a combination thereof.

5. The system of claim 4, further comprising a further bridle segment extending between the rotatable towpoints.

6. The system of claim 5, wherein the further bridle segment is connected to the upper and lower bridle segments.

7. The system of claim 4, wherein the rotatable towpoints are pulleys, and wherein the bridle segments form a loop that extends around the pulleys.

8. The system of claim 5, wherein the actuator repositions the bridle segment extending between the rotatable towpoints.

9. The system of claim 1, wherein the actuator repositions the upper connection point, the lower connection point, or a combination thereof.

10. The system of claim 1, wherein the depth of the deflector body is controlled by varying the tilt angle of the deflector body being towed in water behind a vessel.

11. The system of claim 1, wherein the deflector body is selected from a wing deflector and a deflector door.

12. The system of claim 1, wherein the deflector body includes a buoyancy element.

13. The system of claim 1, wherein the deflector body is part of a deflector that is slightly negatively buoyant.

14. The system of claim 1, further comprising:
a controller in communication with the actuator.

15. The system of claim 14, further comprising:
a sensor for measuring at least one parameter of the deflector and communicating the at least one parameter measurement to the controller, wherein the controller provides a command to the actuator to achieve at least one parameter setpoint.

16. The system of claim 15, wherein the at least one parameter is selected from depth of the deflector, motion of the deflector, orientation of the deflector, and combinations thereof.

17. The system of claim 15, wherein the controller is located within the deflector, the system further comprising a remotely located controller for providing the setpoint depth to the controller within the deflector.

18. The system of claim 15, wherein the remotely located controller is located on the vessel.

19. The system of claim 1, wherein the seismic cable is a lead-in.

20. The system of claim 1, wherein the seismic cable is a streamer.

21. The system of claim 1, wherein the deflector is not suspended from a separate flotation device.

22. The system of claim 1, wherein the deflector is independent from a separate flotation device.

23. The system of claim 22, wherein an upper end of the deflector has more buoyancy that the lower end of the deflector.

24. The system of claim 1, wherein the deflector comprises:
a weight element mounted on the lower end of the deflector body; and
a buoyancy element mounted on the upper end of the deflector body.

25. The system of claim 14, wherein the controller causes the actuator to vary the angle between the deflector and the cable so that the vertical component of lift from the deflector is substantially equal to the vertical component of gravity minus the vertical component of tension in the cable.

26. The system of claim 1, wherein the deflector body has a streamlined configuration with a longitudinal axis extending generally downwardly in use.

27. The system of claim 26, wherein the upper and lower segments of the bridle are connected to the deflector body on a line extending parallel to the longitudinal axis of the deflector body.

28. The system of claim 27, wherein the line is forward of the longitudinal axis.

29. The system of claim 27, wherein the upper and lower segments have a length that is adjustable.

30. The system of claim 1, further comprising:

at least one actuator for adjusting the angle of attack of the deflector body.

31. The system of claim 30, wherein the deflector body is selected from a wing deflector and a deflector door.

32. The system of claim 1, further comprising:

a pivot float attached to the cable forward of the deflector body.

33. The system of claim 32, wherein the pivot float serves as a pivot point from which the deflector pivots when the deflector depth is adjusted.

34. The system of claim 1, wherein the at least one actuator includes at least two actuators that are load balanced.

35. A deflector, comprising:

a deflector body adapted for coupling to a cable to be towed in water behind a vessel;

a first actuator for varying the angle of attack of the deflector body; and

a second actuator for varying the tilt angle of the deflector body, wherein the first and second actuators are operated independently.

36. The deflector of claim 35, characterised in that the depth of the deflector body is controlled by varying the tilt angle of the deflector body.

37. The deflector of claim 35, wherein the tilt angle is varied by pivoting the deflector body about an axis that is generally transverse the direction of water flow relative to the deflector.

38. The deflector of claim 35, wherein the deflector body is selected from a wing deflector and a deflector door.

39. The deflector of claim 35, wherein the second actuator is coupled to a first controllably movable flap to one side of the deflector centre of lift.

40. A deflector, comprising:

a generally upright deflector body including a connection point for coupling to a cable to be towed in water behind a vessel; and

at least one controllably movable flap coupled to the deflector body to vary the tilt angle of the deflector body.

41. The deflector of claim 40, further comprising:

at least one bridle connected to a seismic cable, the bridle including an upper segment secured to an upper connection point on the deflector body, and a lower segment coupled to a lower connection point on the deflector body, wherein the upper segment, lower segment and deflector body define a geometry therebetween; and

at least one actuator for adjusting the geometry to control the tilt angle of the deflector body.

42. The deflector of claim 40, wherein the depth of the deflector body is controlled by varying the tilt angle of the deflector body being towed in water behind a vessel.

43. The deflector of claim 40, wherein the tilt angle is varied by pivoting the deflector about an axis that is generally transverse to the cable.

44. The deflector of claim 40, wherein the deflector body is selected from a wing deflector and a deflector door.

45. The deflector of claim 40, wherein the deflector body includes a buoyancy element.

46. The deflector of claim 40, wherein the deflector body is slightly negatively buoyant.

47. The deflector of claim 40, further comprising:
a pivot float attached to the cable forward of the deflector.

48. The deflector of claim 47, wherein the pivot float serves as a pivot point from which the deflector body pivots when the depth of the deflector is adjusted.

49. A method for controlling the depth of a deflector under tow, comprising:
varying the tilt angle between the deflector and a cable, wherein a change in the tilt angle causes the deflector to change depth.

50. The method of claim 49, wherein the tilt angle is varied about an axis that is generally transverse the direction of water flow relative to the deflector.

51. The method of claim 49, further comprising:
remotely controlling the tilt angle to change the depth.

52. The method of claim 49, further comprising:
adjusting the length of one or more segments of a bridle that defines a first segment between a cable connection point and an upper connection point on the deflector

and a second segment between the cable connection point and a lower connection point on the deflector.

53. The method of claim 49, further comprising:
controllably adjusting angle of flaps on upper and lower segments of the deflector to varying the tilt angle of the deflector.

54. The method of claim 49, further comprising:
measuring the depth of the deflector; and
providing a command for the deflector to achieve a different depth.

55. The method of claim 49, further comprising:
adjusting a tow-point with respect to the deflector body between the forward and rearward edges thereof.

56. The method of claim 49, further comprising:
coupling a float to the cable upstream of the deflector, wherein a change in the tilt angle causes the deflector to pivot about the float.

57. The method of claim 49, further comprising:
providing a bridle that defines a first segment extending between a cable connection point and an upper rotatable towpoint on the deflector and a second segment extending between the cable connection point and a lower rotatable towpoint on the deflector.

58. The method of claim 57, wherein the upper and lower rotatable towpoints include lever arms, pulleys, or a combination thereof.

59. The method of claim 58, further comprising:
providing a further bridle segment extending between the upper and lower rotatable towpoints.

60. The method of claim 59, further comprising:

rotating the rotatable towpoints to cause a change in the tilt angle of the deflector.

61. The method of claim 60, wherein the upper and lower rotatable towpoints are pulleys, and wherein the bridle segments form a loop that extends around the pulleys.

62. The method of claim 60, further comprising:

repositioning the bridle segment extending between the at least two rotatable towpoints.

63. The method of claim 52, further comprising:

repositioning the upper connection point, the lower connection point, or a combination thereof.

64. The method of claim 49, further comprising:

providing a bridle that defines first and second segments extending between a cable connection point and respective upper left and upper right rotatable towpoints on the deflector and third and fourth segments extending between the cable connection point and respective lower left and lower right rotatable towpoints on the deflector.

65. The method of claim 64, wherein the tilt angle is controlled by adjusting the ratio of the lengths of the first and second segments to the lengths of the third and fourth segments.

66. The method of claim 64, wherein the angle of attack is controlled by adjusting the ratio of the lengths of the first and third segments to the lengths of the second and fourth segments.

67. The system of claim 1, wherein the at least one bridle further comprises:

a second upper segment secured to a second upper connection point transverse the upper connection point on the deflector body and a second lower segment connected to a second lower connection point transverse the lower connection point on the deflector body, wherein the second upper segment, second lower segment and deflector define a second geometry therebetween.

68. The system of claim 67, wherein the actuator adjusts the ratio of the lengths of the upper segment and second upper segment to the lengths of the lower segment and second lower segment.

69. The system of claim 67, further comprising at least one actuator for adjusting the angle of attack of the deflector body.

70. The system of claim 69, wherein the actuator adjusts the ratio of the lengths of the upper segment and lower segment to the lengths of the second upper segment and second lower segment.